

Demand Response Hardware and Tariffs: California's Vision and Reality

**ACEEE Summer Study
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Overview

1. Vision of Demand Response in California
2. Background
3. Overview of Tariffs and Sign-Ups
 - Define and compare current options
4. Preliminary Results of the Statewide Pricing Pilot for smaller customers
5. Business plan for Advanced Metering Infrastructure
6. Outstanding Issues/Concluding Remarks

Vision

- If economic, customers should have a choice of the following rates:
- Residential and Small Commercial (< 200 kW)
 - Default: CPP
 - Options: TOU
- Large Customers (200 kW to 1 MW)
 - Default: CPP
 - Options: TOU, RTP
- Very Large Customers (> 1 MW)
 - Default: RTP
 - Options: TOU, CPP

Background (part 1)

- In Summer 2002, the California Energy Commission, Public Utilities Commission, and Power Authority initiated a joint proceeding on advanced metering, demand response, and dynamic pricing
- The proceeding is novel because it involves three energy agencies in California working together
- Objectives of the OIR
 - Enhance system reliability
 - Reduce power purchases and consumer costs
 - Protect the environment
- Progress to date:
 - Several large-customer tariffs have been offered
 - A small-customer pricing pilot is in progress

Background (Part 2)

- In response to the 2000-2001 crisis, the CEC advocated for (1) advanced meters, and (2) real-time pricing (RTP) tariffs
- AB29x provided funding for the meters: ~25,000 installed
- CPUC rejected RTP tariffs, but required TOU for >200 kW customers
- RTP has been put on hold due to: high retail prices compared to wholesale prices, no day-ahead hourly market, and a controversy regarding development of customer baselines.
- Critical Peak Pricing and Demand Bidding tariffs are available for customers larger than 200 kW
- Utilities will file preliminary business cases re: new metering and billing systems in October, 2004
- Unresolved is how to harmonize the need for price responsive vs. emergency response tariffs/programs

DYNAMIC PRICING vs. TOU PRICES

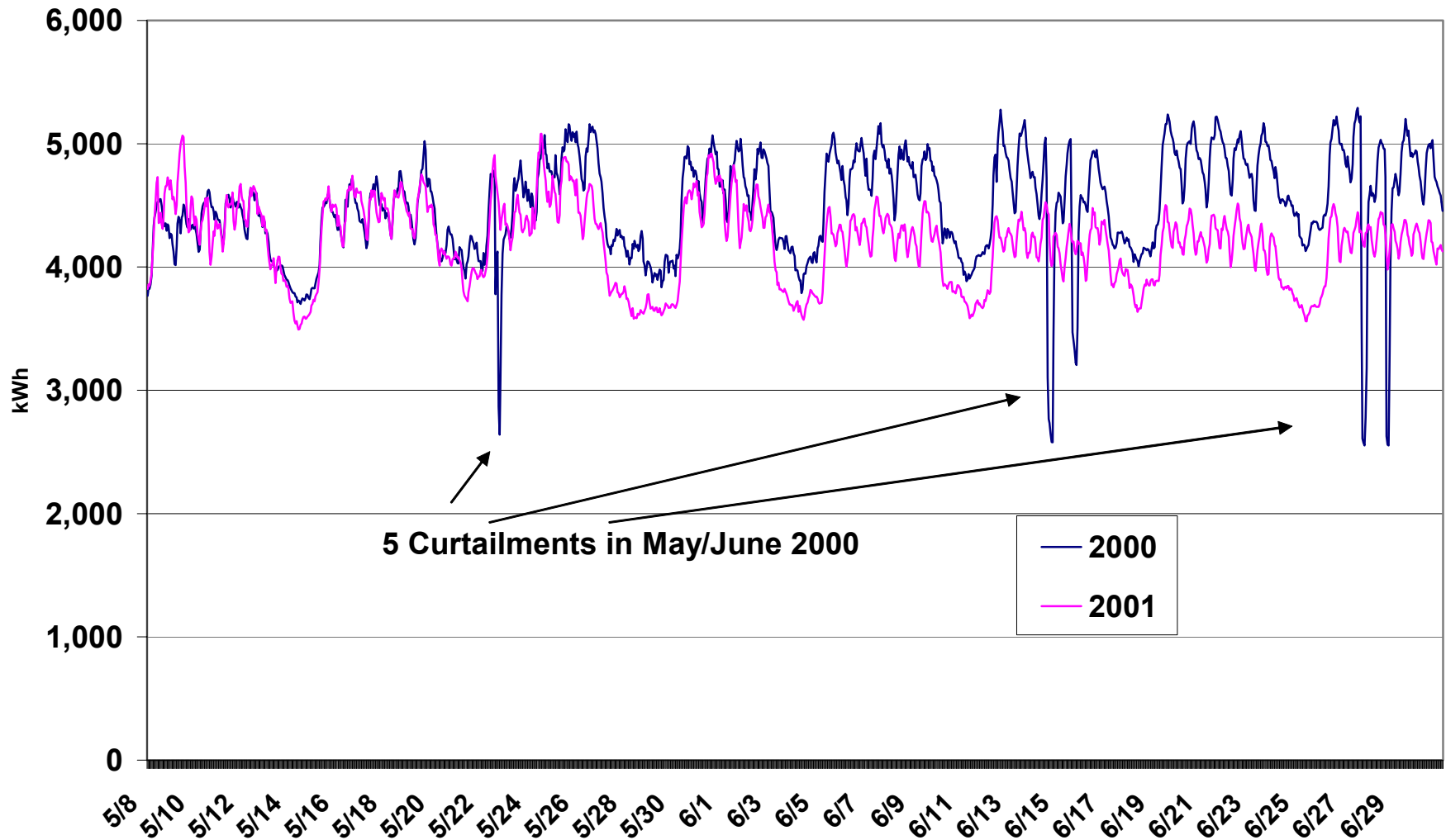
- **Time-of-Use** (TOU) is typically 3 time blocks published in advance for entire season
 - Peak, Shoulder, Off-Peak
 - Can't foresee weather or equipment failures
- **Critical Peak Pricing** (CPP) is a high price imposed on a few days a year when energy is expensive or system conditions are critical or near critical
 - Non-CPP hours are less expensive as a result
 - Day-ahead notification offers additional time for response
- **Real-Time Pricing** (RTP) is hourly real-time marginal cost of a kWh
 - Reflects hot weather, scarcity, or equipment failure
 - Day ahead notification offers additional time for response

Programs/Tariffs in California IOU

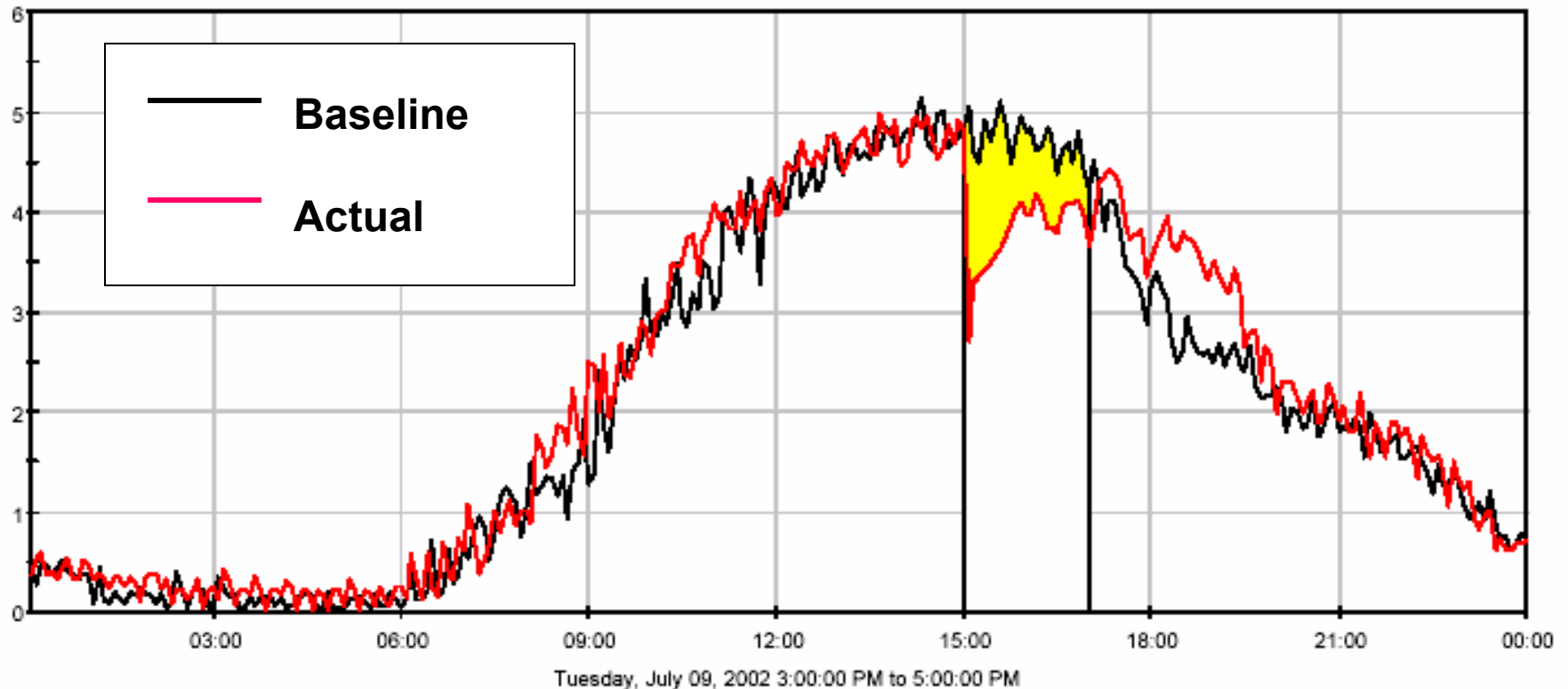
- **Interruptible/Curtailable:** Discounted Demand Charges for “Non-Firm Load”; Limit on number and duration of calls; Penalties for non-performance; ~ ½ hour response time; closed to existing customers
- **Demand Bidding:** Voluntary; Market-based (forecasted hourly price) or System Emergency (\$.50/kWh); paid for performance against at “baseline”; no penalties
- **Critical Peak Pricing:** Tariff with “Super-Peak” prices ~ \$1.00/kWh; “Super-Peak” for ~ 70 hours per summer; compensating reductions in other time periods; revenue neutral for class with no response
- **California Power Authority Demand Response Partnership:** Monthly availability payment (~\$8/kW summer month) and energy payment with performance requirement and non-performance penalties
- **Air Conditioning Cycling/Smart Thermostats:** Traditional A/C cycling or signal to thermostat with “set-up”; override option
- **Backup Generators:** Paid \$0.20/kWh against a baseline; 15 minute response; voluntary; to avoid rolling blackouts

An Example of Interruptible/Curtailable Response

Large Transmission Level Service in PG&E
Average Hourly Load per Customer
May and June 2000 and 2001

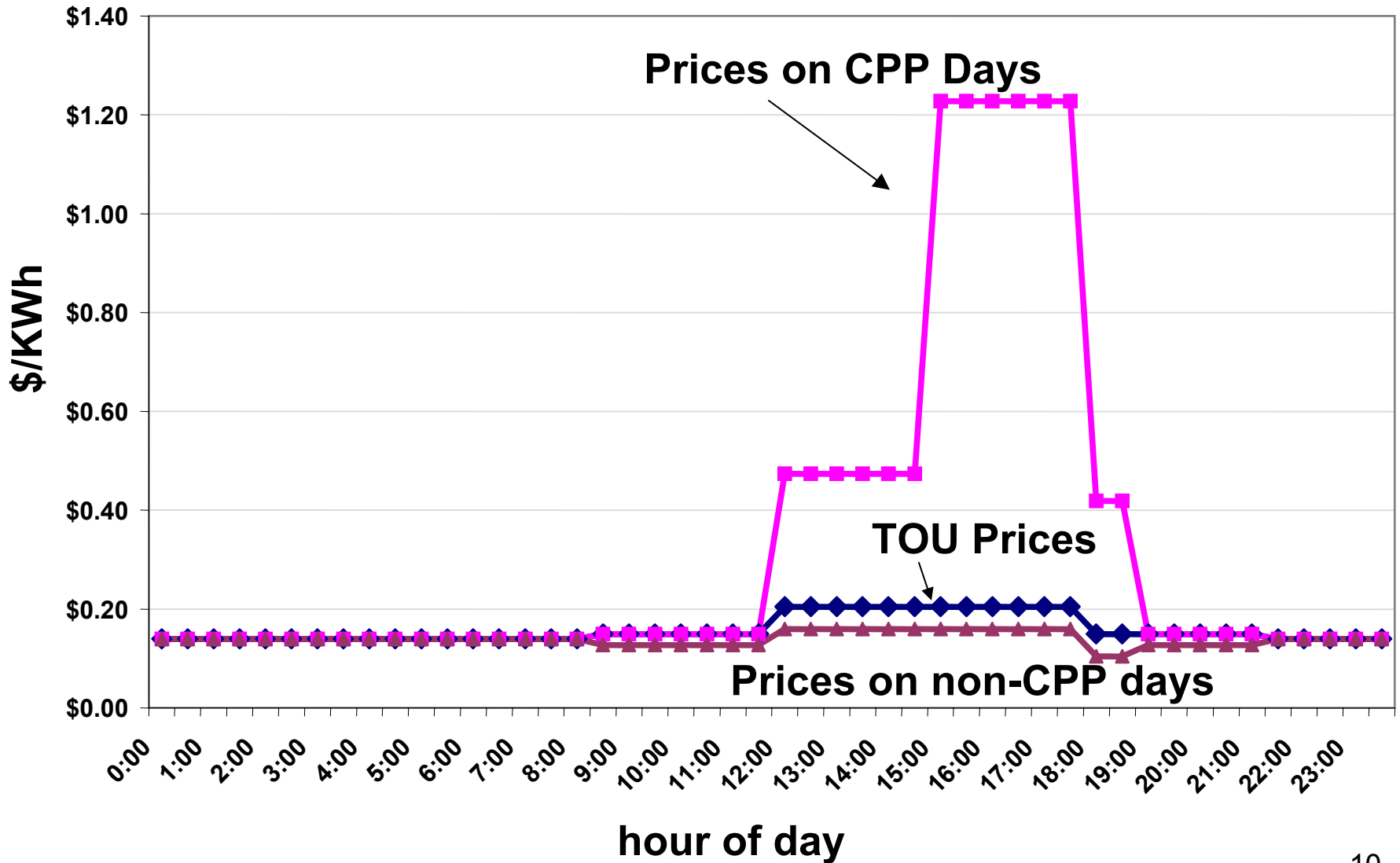


Example of Smart Thermostat Response for Small Commercial Cust. Thermostat Raised 4 deg. F.



Source: Program Impact Evaluation of the 2002 SCE Energy Smart Thermostat Program Final Report, RLW Analytics, 2/28/2003

An Example of a CPP Tariff for Large Customers



Demand Response Programs/Tariffs Investor Owned Utilities as of June 2004 MW Available

	SDGE	SCE	PGE	Total by Program
Interruptible/Curtailable	25	710	360	1,095
Demand Bidding	12	80	60	152
Critical Peak Pricing	7	1	8	16
Power Authority Demand Response	3	12	200	215
Air Conditioning Cyclers/Smart Thermostat	3	300	0	303
Backup Generators	60	0	0	60
Total by Utility	110	1,103	628	
	Grand Total			1,841

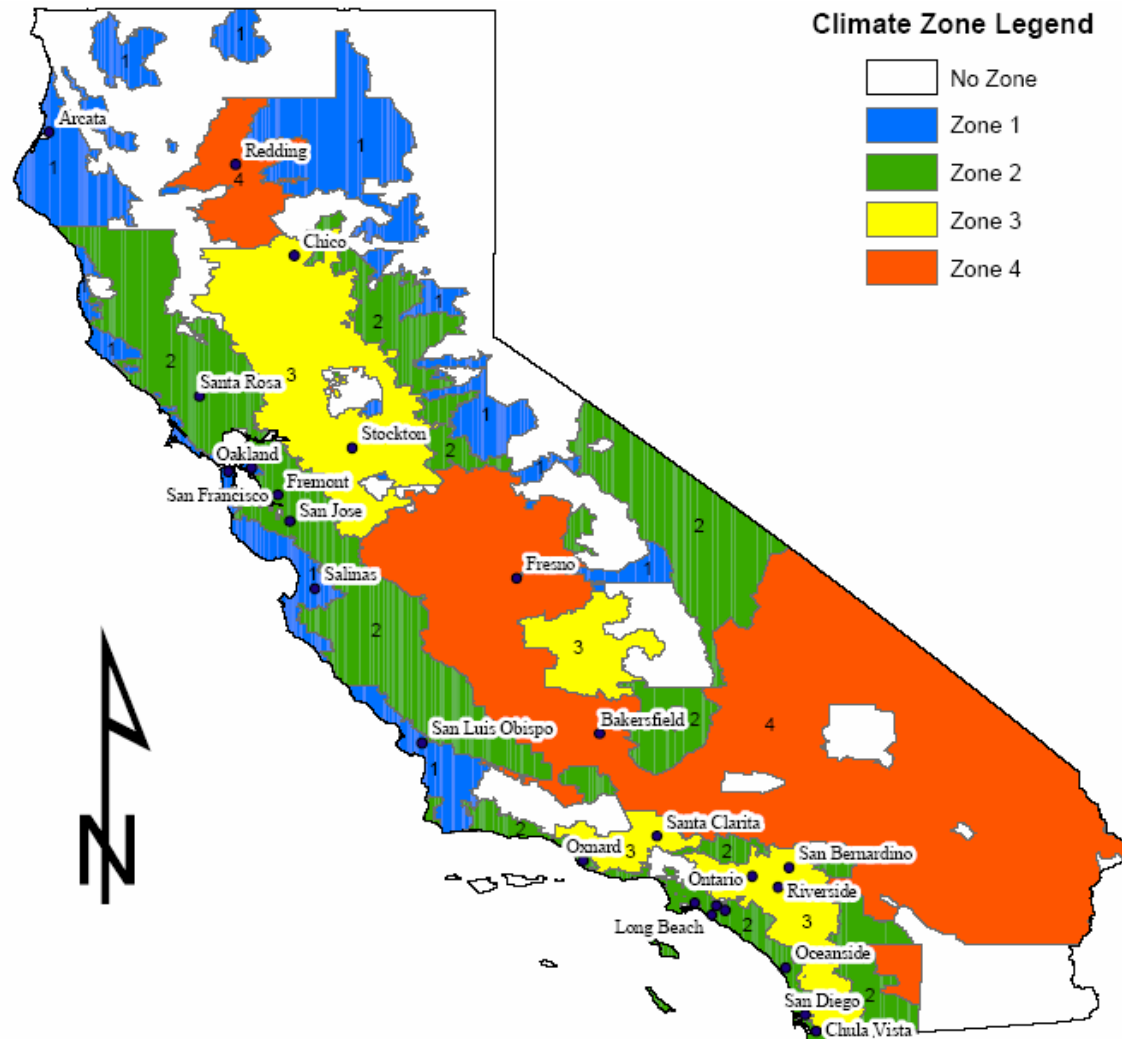
Comparison of Various Rate Options

- **Interruptible/Curtailable Rates:** Offer significant reductions in energy costs (~15%) but stiff penalties for non-performance (~\$8/kWh); can go years with few calls; other years (2001) with many calls; closed to existing customers
- **Demand Bidding:** Relatively modest economic savings; so far limited need for this program in 2003/2004
- **Critical Peak Pricing:** Again, modest upside (~2% if relatively responsive); customer with flatter load shape can benefit; designed to be called 12 times per year, regardless of need
- **California Power Authority Demand Response Partnership:** still uncertainty regarding who controls this program
- **Air Conditioning Cycling/Smart Thermostats:** generally for smaller customers; various interruption/incentive combinations
- **Backup Generators:** intended only to prevent rolling blackouts; some controversy re: environmental impacts; only in SDG&E

A Statewide Pilot to Test Various Rates and Customer Response

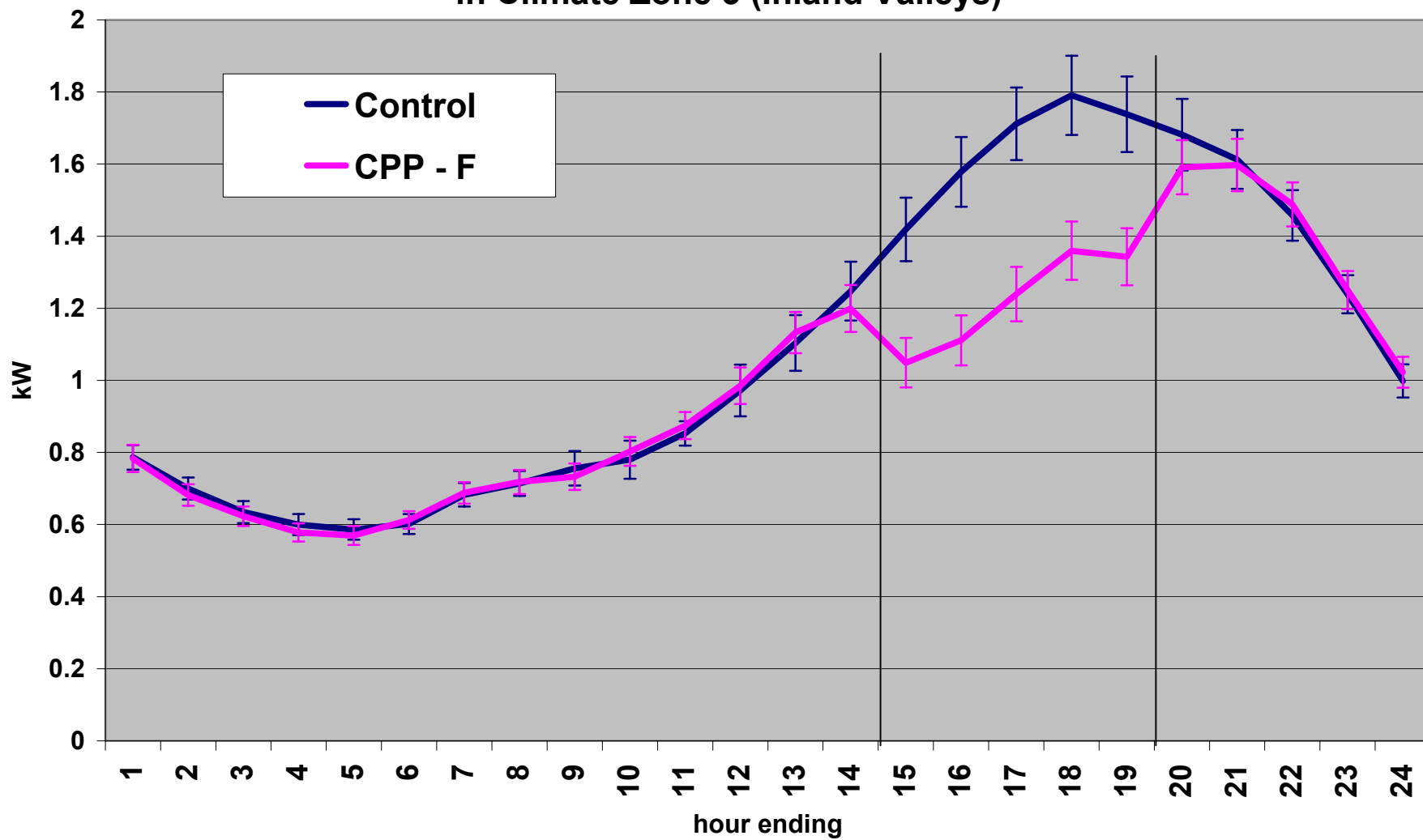
- Beginning in the Summer of 2003, 2,500 customers involved in various pricing pilots to test response to:
 - Time-of-Use
 - Critical Peak Price with a fixed critical peak time period (CPP_F)
 - Critical Peak Price with variable time period (CPP_V)
 - And with smart thermostats
- Charles River Associates conducted extensive analysis of data
 - Using various techniques
- Also the CEC assessed some of the data
- A sampling of the results follow
- In summary, residential response of ~12% for CPP_F during critical peak events; up to ~45% for CPP_V with smart thermostat
 - For all the details see Statewide Pricing Pilot Summer 2003 Impact Analysis, Charles River Associates. Visit soon www.energy.ca.gov/DemandResponse/Documents/SPP_reports

SPP climate zones vary from cool Zone 1 to very warm Zone 4



Source: CRA presentation, May 22 Chicago Pricing Conference

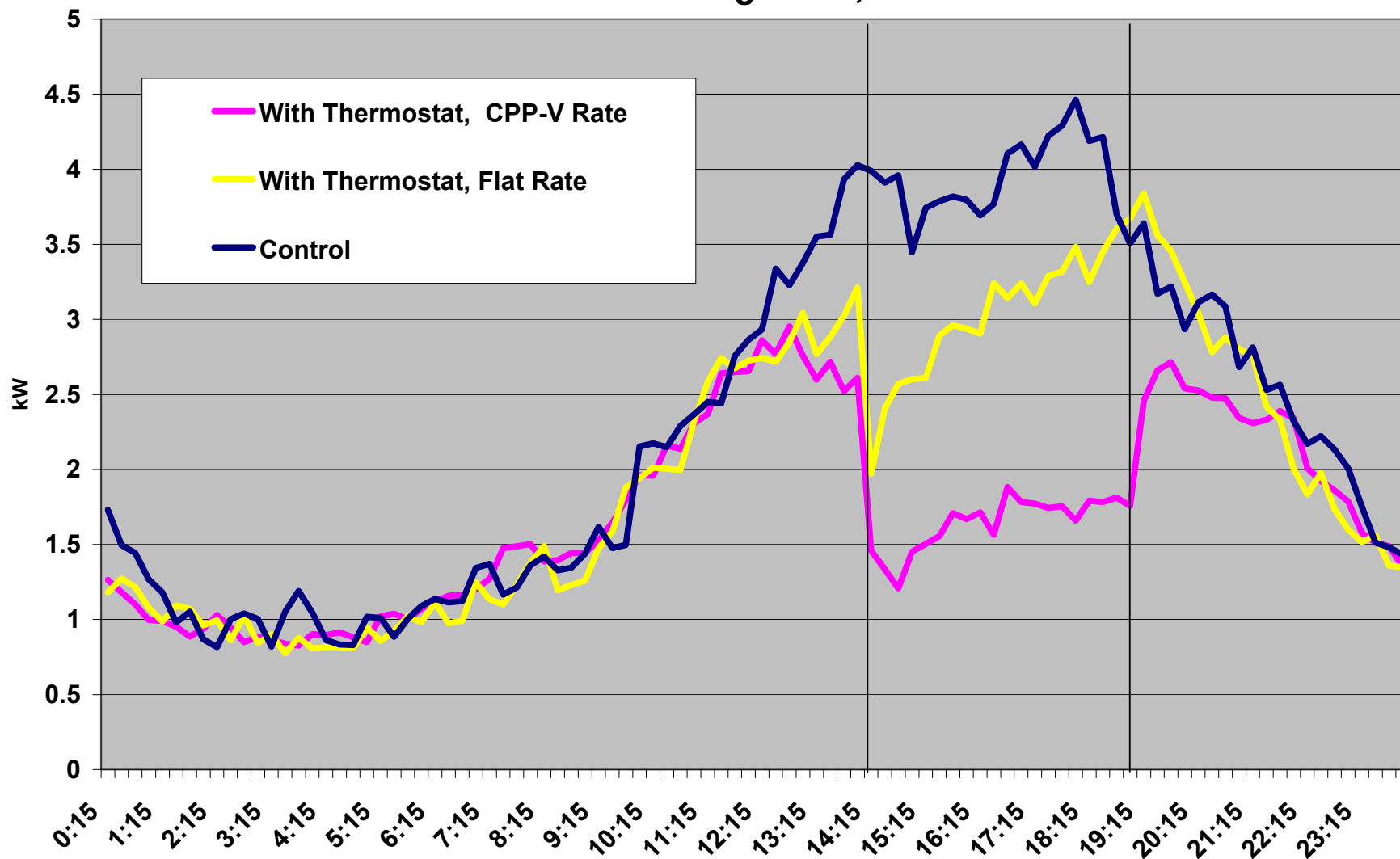
**CPP- F Experiment, Average Over All 12 CPP-F days
in Climate Zone 3 (Inland Valleys)**



A Very Hot Day in San Diego

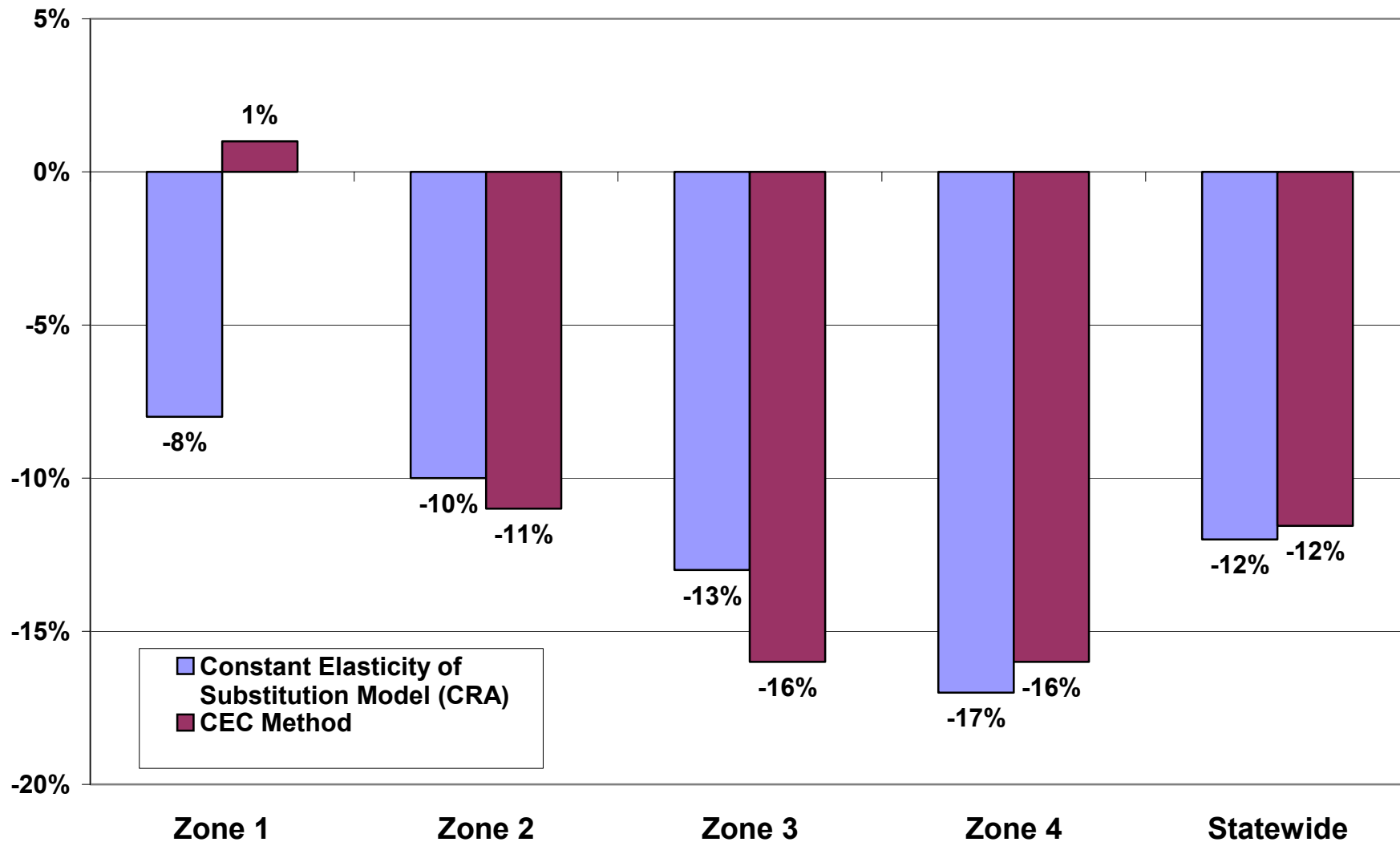
CPP-V Experiment in SDG&E

Results from August 15, 2003



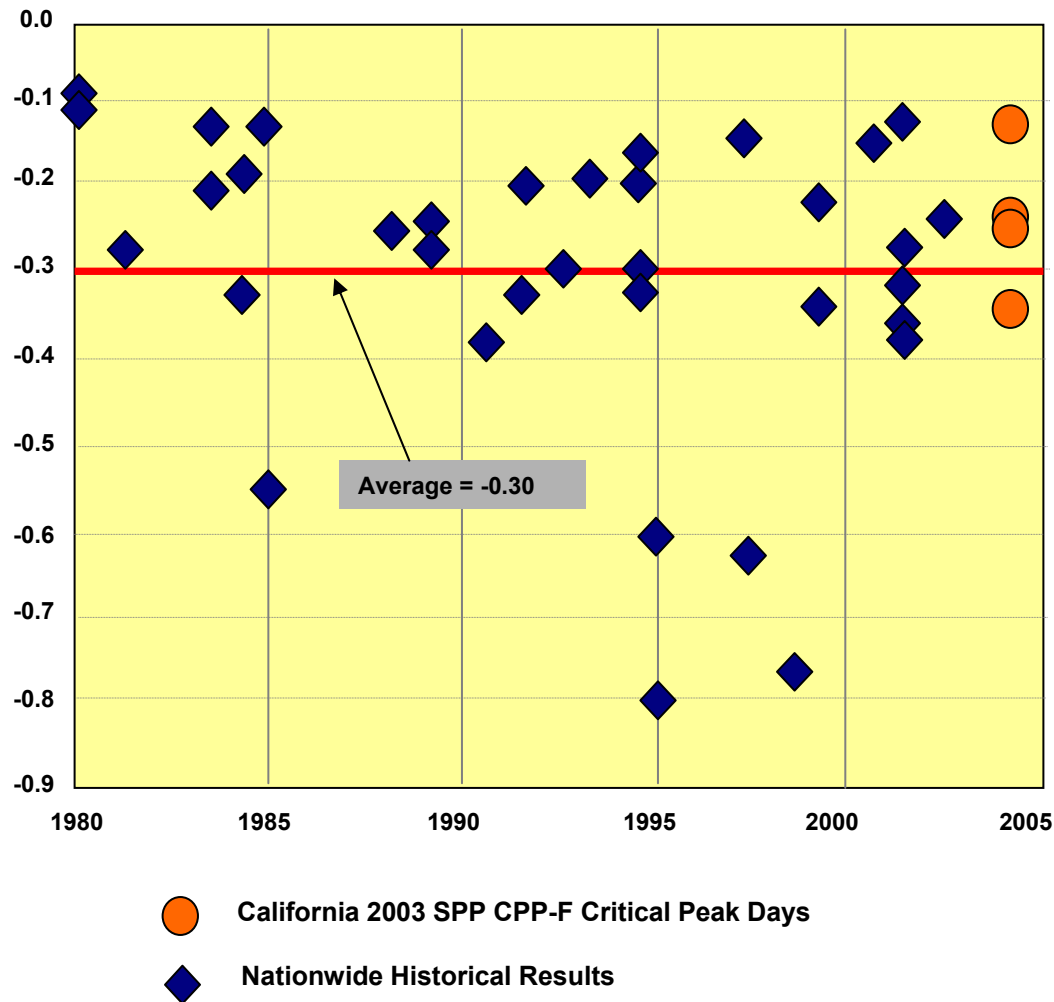
The most current results

Change in Consumption during Peak Period for CPP_F customers
on Critical Peak Days -- Summer 2003



Own-Price Elasticities

California SPP vs. Nationwide Historical Results



Source: Predicting California Demand Response, Chris King and Sanjoy Chatterjee, Public Utilities Fortnightly, July 1, 2003, p.27-32 w/ CPP-F data added by Roger Levy, May, 2004

Summary of Pilot Results to Date

- Customers on CPP_F, CPP_V, and TOU respond to price
- Results are consistent with other studies
- In my opinion, the 2003 data have been sufficiently analyzed
- Awaiting, results from 2004
- Next step will be development of Advanced Metering Infrastructure Business Cases
 - Filings in October 2004

Ongoing issues

- **How much DR can be counted upon**
 - **At what price or during what sort of “near-emergency” system conditions**
 - **Duration of such response**
 - **An hour or two or longer?**
 - **How quickly can response occur?**
 - **How to value such various types of response?**
 - **Like a combustion turbine? More or less valuable**
 - **Business Case Development**
 - **Regulatory Structure in California**
 - **Direction is a bit cloudy at the moment**
 - **A “capacity” market with reserve margins of 15% to 17% may include both capacity and energy payments, hence may moderate and complicate real time prices.**
 - **Not determined how demand response will figure into this calculation, but it’s clear that CPUC intends to include it, somehow**

Concluding Remarks

- Price responsive demand will enhance the competitiveness of electricity markets
- A direct link between wholesale and retail markets is essential
- However, other types of electrical system emergencies may require instantaneous load response
- California had a separate proceeding dealing with interruptible load programs
- We plan to merge price-sensitive demand response and interruptible programs
 - For example, one approach could involve a curtailment signal that a customer would not have the option to over ride.
- Yet, additional infrastructure is needed for this to occur
- And, only time will tell how this plays out